

TEST REPORT

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EVALUATION CENTER

Intertek Testing Services,
Building T52-8, No. 1201 Gui Qiao Road,
Jinqiao Development Area, Pudong District
Shanghai, 201206

RENDERED TO

Multipanel UK Ltd
Unit 6, Site 2, Oak Business Units, Thorverton Road,
Matford, Exeter, Devon EX2 8FS UK

PRODUCT EVALUATED: Aluminum Composite Panel
EVALUATION PROPERTY: Density and Specific Gravity,
Peel Strength, Punch Shear Strength, Flexural Strength,
Linear Thermal Expansion, Tension Testing

**Report of testing in accordance with the following criteria:
ASTM D792-2008, ASTM D903-1998(Reapproved 2004),
ASTM D732-2002, ASTM D790-2007, ASTM D696-2003,
and ASTM E8-2008**

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2 Introduction

Intertek Testing Services has conducted testing for Multipanel UK Ltd. on aluminum composite panel samples to evaluate "Density and Specific Gravity", "Peel Strength", "Punch Shear Strength", "Flexural Strength", "Linear Thermal Expansion" and "Tension Testing". Testing was conducted in accordance with ASTM D792-2008, ASTM D903-1998(Reapproved 2004), ASTM D732-2002, ASTM D790-2007 and ASTM D696-2003 and ASTM E8-2008. This evaluation began on November 11, 2008 and was completed on December 4, 2008.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client. Samples were not independently selected for testing. Samples were received at the Evaluation Center on November 3, 2008.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The quantity of the samples supplied was 32 pieces. The nominal sizes of the aluminum composite panel samples were summarized in Table 1 below.

Table 1 Aluminum Composite Panel Nominal Dimensions		
Length (mm)	Width (mm)	Thickness (mm)
300	300	4 / 0.5 (Aluminum Layer)
305	25	4 / 0.5 (Aluminum Layer)
50	50	4 / 0.5 (Aluminum Layer)
127	127	4 / 0.5 (Aluminum Layer)

4 Testing and Evaluation Methods

4.1. DENSITY AND SPECIFIC GRAVITY (RELATIVE DENSITY)

The test was conducted in accordance with ASTM D792-2008. The apparent mass of specimen was weighed at 23°C. After the specimen was attached to the holder and immersed in distilled water at 23°C, the apparent mass of the specimen completely immersed and holder in water, and apparent mass of totally immersed holder were determined. Then the Density and Specific Gravity was calculated accordance with Section 13.3 of ASTM D792-2008.

4.2. PEEL STRENGTH

The test was conducted in accordance with ASTM D903-1998(Reapproved 2004). The aluminum layer of specimen was separated from the specimen as specified in accordance with Section 6 of the standard. The specimen was clamped in one grip of tensile machine, and the aluminum layer was turned back and clamped in the other grip. The separating member was stripped from the specimen at an angle of 180°. Then the average load of peel strength was determined.

4.3. PUNCH SHEAR STRENGTH

The test was conducted in accordance with ASTM D732-2002. The specimen was placed in the punch testing apparatus and fastened tightly by means of the washer and nut. The punch was pushed in the speed of 1.25 mm/minute until the specimen was cleared by the punch. Then the shear strength was determined by dividing the load required to shear the specimen by the area of the sheared edge.

4.4. FLEXURAL STRENGTH

The test was conducted in accordance with ASTM D790-2007. The specimen was placed on the span supports and a three-point loading system was applied to the specimen. The load was applied at a uniform rate which was calculated by Equation 1 specified in Section 10.1.4 until the specimen was failure. Then the flexural stress at break was determined.

4.5. LINEAR THERMAL EXPANSION

The test was conducted in accordance with ASTM D696-2003. The thickness of the conditioned specimens was measured at room temperature. The specimen was mounted in a dilatometer which was then installed in the -30°C to -28°C environment until no further movement indicated by the measuring device over a period of 5 to 10 minutes. The other specimen was mounted in a dilatometer which was then installed in the +20°C to +30°C environment until no further movement indicated by the measuring device over a period of 5 to 10 minutes. Then the coefficient of linear thermal expansion over the temperature range was calculated in accordance with the requirements in ASTM D696-2003 Section 11.

4.6. TENSION TESTING

The test was conducted in accordance with ASTM E 8/E 8M-2008. The specimen was prepared in Sheet-Type in accordance with Section 6. Then it was tensile at strain rate of 0.5 mm/minute until it was broken. Then the Tensile Strength, Modulus of Elasticity, Yield Strength (offset=0.2%) and Elongation was determined.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

The sample test results are shown in Table 2 below.

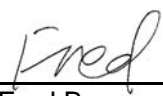
Table 2. Test Results	
Test Description	Test Result
Density and Specific Gravity, kg/m ³	1380
Peel Strength, Kg/mm of Width	1.07
Punch Sheer Strength, MPa	21.1
Flexural Stress (at break), MPa	135.4
Linear Thermal Expansion, 1/K	215.6×10^{-6}
Tension Testing	
● Tensile Strength, MPa	187
● Modulus of Elasticity, MPa	91300
● Yield Strength (offset=0.2%), MPa	170
● Elongation, %	7.5

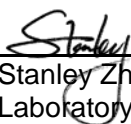
6 Conclusion

The test samples identified and evaluated in this report have been tested in accordance with recognized ASTM procedures. The test samples have shown physical properties as presented in Section 5 of this report.

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK TESTING SERVICES

Reported by: 
Fred Bao
Project Engineer, Building Products

Reviewed by: 
Stanley Zhou
Laboratory Manager, Building Products
